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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/825,870	04/05/2001	Leonid Grigorian	052833-5004	3120

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EXAMINER

LISH, PETER J

ART UNIT PAPER NUMBER

1754

DATE MAILED: 04/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/825,870

Applicant(s)

GRIGORIAN ET AL.

Examiner

Peter J Lish

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11/10/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Applicant's arguments filed 1/22/04 have been fully considered but they are not persuasive. Regarding the request for the withdrawal of finality concerning the final rejection, 7/22/03, applicant argues that Xu et al. was not previously used and was not required due to applicant's amendment. However, Xu et al. was required by the amendment. Resasco was previously used to reject claims 1-18. Applicant's amendment overcame these rejections and thus necessitated a new ground of rejection. Xu et al. was used to supply this new ground of rejection. Applicant additionally argues concerning a new rejection under 35 U.S.C. 112 first paragraph, however, examiner sees no record of such a rejection. *However, the filing of the RCE removes the finality.*

Regarding applicant's arguments with respect to Xu et al., applicant argues that Xu et al. teach the use of extremely low pressures and cite column 15, lines 5-15. This paragraph, however, is not drawn toward the growth of the carbon fibers, but rather is in reference to a method of emitting electrons. Applicants additionally argue that the range cited by the examiner (namely that of column 8, lines 61-63) of between 1 millitorr and several atmospheres is regarding only the carbon-containing gas. The reference teaches this pressure regarding the carbon-containing gas as well as any carrier gas or additional gases. Therefore, it is expected that this pressure range be the pressure at which the growth of the carbon fiber occurs. Applicant additionally cites column 21, lines 64-65 which cites a pressure of about 200 millitorr. This pressure is within the range cited by the examiner and thus serves to support the pressure range cited by the examiner.

Furthermore, in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., a

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pressure of about 600 torr) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). The claims recite a pressure of less than about 600 torr, a pressure range clearly taught by the prior art to Xu et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-4 and 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. (US 5,973,444).

Xu teaches a process for the growth of carbon nanotubes by the chemical vapor deposition of a carbon-containing gas over a transition metal catalyst. The catalyst material of Xu is preferably selected from iron, nickel, cobalt, and mixtures or alloys thereof. The catalyst support is preferably silica or alumina. The carbon source may be chosen from any hydrocarbon gas, such as methane, ethane, etc. The pressure of the carbon source can be from one millitorr to several atmospheres, either in pure form or in a carrier gas such as argon and nitrogen. A pressure of 200 millitorr is taught in the example. The temperature may be controlled within the range between 500 and 1000 °C, however the preferred upper limit is between 700 and 800 °C

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(columns 7-9). It would have been obvious to one of ordinary skill at the time of invention to use methane gas over an alumina-supported iron catalyst within the temperature and pressure ranges as claimed by applicant, because doing so is seen to be the optimization of a known process, which could have been determined through routine experimentation, and is held to be obvious by *In re Boesch*, 205 USPQ 215.

Regarding claim 8, Xu does not teach a specific ratio of methane to carrier gas. However, it would have been obvious to one of ordinary skill at the time of invention to use a gas composition ratio within the range claimed by the applicant because the use of a specific gas mixture ratio is viewed to be the optimization of a known process, held to be obvious by *In re Boesch* (205 USPQ 215) unless significantly different and unexpected results are shown.

Claims 5 and 9-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu et al. (US 5,973,444) as applied above and further taken with Resasco et al. (US 6,413,487).

Xu is applied above. Xu does not specifically teach the use of iron-molybdenum catalysts. Resasco, however, teaches that bimetallic catalysts containing at least one of a Group VIII metal, such as Fe or Co, and one of a Group VIb metal, such as Mo, have a synergism which makes them effective catalysts for the production of single-walled carbon nanotubes. Furthermore, a catalyst made up of more than one Group VIII metal and a single Group VIb metal is taught (column 7, lines 28-51). It therefore would be obvious to one of ordinary skill at the time of invention to choose either Fe, Co, or a mixture of the two as the Group VIII metal and to choose Mo as the Group VIb metal.

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Regarding claims 5, 10, and 14-16, Resasco teaches that the ratio of the Group VIII metal to the Group VIb metal is preferably from about 1:10 to about 15:1. Further, the total amount of bimetallic catalyst deposited on the support may vary widely, but is generally in an amount of from about 1% to about 20% of the total weight of the metallic catalytic particle (column 8, lines 1-5). Given the teaching of Resasco et al., it would have been obvious to one of ordinary skill at the time of invention to use the claimed ratios of the applicant. Additionally, the use of specific catalyst ratios is viewed to be the optimization of a known process, held to be obvious by *In re Boesch* (205 USPQ 215) unless significantly different and unexpected results are shown.

It would have been obvious to one of ordinary skill at the time of invention to use the catalyst material of Resasco et al. in the process of Xu et al. in order to take advantage of the increased yield of single-walled nanotubes, which perform as high quality field emitters.

Regarding the diameters of the single-walled carbon nanotubes produced by this process. Resasco teaches that the diameter of SWNTs generally varies from 1 nm to 5 nm (column 2, lines 3-6). Additionally, it is expected that the product of the process, as taught by the combination of Xu et al. with Resasco et al., will be identical to that claimed by the applicant.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Lish whose telephone number is 571-272-1354. The examiner can normally be reached on 9:00-6:00 Monday through Friday.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PL



STUART L. HENDRICKSON
PRIMARY EXAMINER